

APPENDIX A

Wireless

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Wireless communication is the transfer of *information* over a distance without the use of electrical conductors or "wires".^[1] The distances involved may be short (a few meters as in television remote control) or very long (thousands or even millions of kilometers for radio communications). When the context is clear the term is often simply shortened to "wireless". Wireless communications is generally considered to be a branch of telecommunications.

It encompasses various types of fixed, mobile, and portable two way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of *wireless technology* include GPS units, garage door openers and or garage doors, wireless computer mice, keyboards and headsets, satellite television and cordless telephones.

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Introduction to Wireless

Wireless operations permits services, such as long range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g., radio transmitters and receivers, remote controls, computer networks, network terminals, etc.) which use some form of energy (e.g. radio frequency (RF), infrared light, laser light, visible light, acoustic energy, etc.) to transfer information without the use of wires.^[2] Information is transferred in this manner over both short and long distances.

Wireless communication

The term "wireless" has become a generic and all-encompassing word used to describe communications in which electromagnetic waves or RF (rather than some form of wire) carry a signal over part or the entire communication path. Common examples of wireless equipment in use today include:

- Professional LMR (Land Mobile Radio) and SMR (Specialized Mobile Radio) typically used by business, industrial and Public Safety entities
- Consumer Two Way Radio including FRS (Family Radio Service), GMRS (General Mobile Radio Service) and Citizens band ("CB") radios
- The Amateur Radio Service (*Ham radio*)
- Consumer and professional Marine VHF radios
- Cellular telephones and pagers: provide connectivity for portable and mobile applications, both personal and business.
- Global Positioning System (GPS): allows drivers of cars and trucks, captains of boats and ships, and pilots of aircraft to ascertain their location anywhere on earth.
- Cordless computer peripherals: the cordless mouse is a common example; keyboards and printers can also be linked to a computer via wireless.
- Cordless telephone sets: these are limited-range devices, not to be confused with cell phones.
- Satellite television: allows viewers in almost any location to select from hundreds of channels.
- Wireless Gaming: New gaming consoles allow players to interact and play in the same game regardless of whether they are playing on different consoles. Players can chat, send text messages as well as record sound and send it to their friends. Controllers also use wireless technology. They do not have any cords but they can send the information from what is being pressed on the controller to the main console which then processes this information and makes it happen in the game. All of these steps are completed in milliseconds.

Wireless networking (i.e. the various flavors of unlicensed 2.4 GHz WiFi devices) is used to meet a variety of needs. Perhaps the most common use is to connect laptop users who travel from location to location. Another common use is for mobile networks that connect via satellite. A wireless transmission method is a logical choice to network a LAN segment that must frequently change locations. The following situations justify the use of wireless technology:

- To span a distance beyond the capabilities of typical cabling,



Handheld wireless radios such as this Maritime VHF radio transceiver use electromagnetic waves to implement a form of wireless communications technology.

- To avoid obstacles such as physical structures, EMI, or RFI,
- To provide a backup communications link in case of normal network failure,
- To link portable or temporary workstations,
- To overcome situations where normal cabling is difficult or financially impractical, or
- To remotely connect mobile users or networks.

Wireless communication may be via:

- radio frequency communication,
- microwave communication, for example long-range line-of-sight via highly directional antennas, or short-range communication, or
- infrared (IR) short-range communication, for example from remote controls or via IRDA,

Applications may involve point-to-point communication, point-to-multipoint communication, broadcasting , cellular networks and other wireless networks.

The term "wireless" should not be confused with the term "cordless", which is generally used to refer to powered electrical or electronic devices that are able to operate from a portable power source (e.g., a battery pack) without any cable or *cord* to limit the mobility of the cordless device through a connection to the mains power supply. Some cordless devices, such as cordless telephones, are also wireless in the sense that information is transferred from the cordless telephone to the telephone's base unit via some type of wireless communications link. This has caused some disparity in the usage of the term "cordless", for example in Digital Enhanced Cordless Telecommunications.

In the last 50 years, wireless communications industry experienced drastic changes driven by many technology innovations.

History

The term "Wireless" came into public use to refer to a radio receiver or transceiver (a dual purpose receiver and transmitter device), establishing its usage in the field of wireless telegraphy early on; now the term is used to describe modern wireless connections such as in cellular networks and wireless broadband Internet. It is also used in a general sense to refer to any type of operation that is implemented without the use of wires, such as "wireless remote control", "wireless energy transfer", etc. regardless of the specific technology (e.g., radio, infrared, ultrasonic, etc.) that is used to accomplish the operation.

Early wireless work

David E. Hughes, eight years before Hertz's experiments, induced electromagnetic waves in a signaling system. Hughes transmitted Morse code by an induction apparatus. In 1878, Hughes's induction transmission method utilized a "clockwork transmitter" to transmit signals. In 1885, T. A. Edison used a vibrator magnet for induction transmission. In 1888, Edison deploys a system of signaling on the Lehigh Valley Railroad. In 1891, Edison attains the wireless patent for this method using inductance (U.S. Patent 465,971 (<http://patft.uspto.gov/netacgi/nph-Parser?patentnumber=465971>)).

In the history of [wireless technology], the demonstration of the theory of electromagnetic waves by

Heinrich Rudolf Hertz in 1888 was important.^{[3][4]} The theory of electromagnetic waves were predicted from the research of James Clerk Maxwell and Michael Faraday. Hertz demonstrated that electromagnetic waves could be transmitted and caused to travel through space at straight lines and that they were able to be received by an experimental apparatus.^{[3][4]} The experiments were not followed up by Hertz and the practical applications of the wireless communication and remote control technology would be implemented by Nikola Tesla.

Further information: Invention of radio

The electromagnetic spectrum

Light, colours, AM and FM radio, and electronic devices make use of the electromagnetic spectrum. In the US the frequencies that are available for use for communication are treated as a public resource and are regulated by the Federal Communications Commission. This determines which frequency ranges can be used for what purpose and by whom. In the absence of such control or alternative arrangements such as a privatized electromagnetic spectrum, chaos might result if, for example, airlines didn't have specific frequencies to work under and an amateur radio operator was interfering with the pilot's ability to land an airplane. Wireless communication spans the spectrum from 9 kHz to 300 GHz. (Also see Spectrum management)

Applications of wireless technology

Security systems

Wireless technology may supplement or replace hard wired implementations in security systems for homes or office buildings.

Television remote control

Modern televisions use wireless (generally infrared) remote control units. Now radio waves are also used.

Cellular telephony (phones and modems)

Perhaps the best known example of wireless technology is the cellular telephone and modems. These instruments use radio waves to enable the operator to make phone calls from many locations world-wide. They can be used anywhere that there is a cellular telephone site to house the equipment that is required to transmit and receive the signal that is used to transfer both voice and data to and from these instruments.

WiFi

Main Article: Wi-Fi

Wireless energy transfer

Wireless energy transfer is a process whereby electrical energy is transmitted from a power source to an electrical load that does not have a built-in power source, without the use of interconnecting wires.

Categories of wireless implementations, devices and standards

- Radio communication system
 - Broadcasting
 - Amateur radio
 - Land Mobile Radio or Professional Mobile Radio: TETRA, P25, OpenSky, EDACS, DMR, dPMR
 - Communication radio
 - Cordless telephony: DECT (Digital Enhanced Cordless Telecommunications)
 - Cellular systems: 0G, 1G, 2G, 3G, Beyond 3G (4G), Future wireless
 - List of emerging technologies
 - Short-range point-to-point communication : Wireless microphones, Remote controls, IrDA, RFID (Radio Frequency Identification), Wireless USB, DSRC (Dedicated Short Range Communications), EnOcean, Near Field Communication
 - Wireless sensor networks : ZigBee, EnOcean; Personal area networks, Bluetooth, Ultra-wideband (UWB from WiMedia Alliance).
 - Wireless computer networks: Wireless Local Area Networks (WLAN), (IEEE 802.11 branded as WiFi and HiperLAN), Wireless Metropolitan Area Networks (WMAN) and Broadband Fixed Access (BWA) (LMDS, WiMAX, WANKA and HiperMAN)

See also

- Mobile
- History of radio, Timeline of radio, Digital radio, Radio resource management (RRM)
- Hotspot (Wi-Fi), Wireless energy transfer, True wireless, Wireless security, Wireless Access Point
- Personal area network, comparison of wireless data standards, List of emerging technologies

References

1. ^a "Wireless Communication (http://www.sintef.no/content/page1____11881.aspx) ". sintef.no. Retrieved on 2008-03-16.
2. ^a "ATIS Telecom Glossary 2007 (<http://www.atis.org/tg2k/>) ". atis.org. Retrieved on 2008-03-16.
3. ^a ^b Story, Alfred Thomas (1904). *A story of wireless telegraphy*. New York, D. Appleton and Co..
4. ^a ^b "Heinrich Rudolf Hertz (<http://chem.ch.huji.ac.il/~eugeniik/history/hertz.htm>) ". chem.ch.huji.ac.il. Retrieved on 2008-03-16.

External links

- Wikia has a wiki on this subject at wireless
- U.S. Patent 1,642,420 (<http://patft.uspto.gov/netacgi/nph-Parser?patentnumber=1642420>) , S. Loewe, "*Wireless Receiving Apparatus*"

- U.S. Patent 1,754,875 (<http://patft.uspto.gov/netacgi/nph-Parser?patentnumber=1754875>) , E. E. Clement, "*Radiophone desk set*"

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Categories: Wireless networking | History of radio | Wireless

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